

1 TRIGGER ASSEMBLY WITH A SAFETY DEVICE FOR A CROSSBOW

2 BACKGROUND OF THE INVENTION

3 1. Field of the Invention

4 The present invention relates to a trigger assembly, and more
5 particularly to a trigger assembly with a safety device for a crossbow, which
6 provides two safety features.

7 2. Description of Related Art

8 A crossbow is a weapon that aims and shoots an arrow at a target. A
9 conventional crossbow substantially comprises a stock, a bow, a bowstring and a
10 trigger assembly. The stock has a front end and a rear end. The bow is
11 transversely mounted on the front end of the stock and has two ends and at least
12 two pulleys mounted respectively on the ends of the bow. The bowstring has two
13 ends with a loop at each end. The loops are attached respectively to the ends of
14 the bow, and the bowstring is mounted around the pulleys and is drawn toward
15 the rear of the stock to propel an arrow when the bowstring is released. The
16 trigger assembly is mounted on the stock and has a catch and a trigger. The catch
17 holds the bowstring in the drawn position and is selectively held in place and
18 released by the trigger. When the trigger is pulled, the drawn bowstring will be
19 released from the catch and the arrow will be shot.

20 As a weapon, the crossbow has the potential to injure people
21 accidentally. Therefore, a safety device is necessary to keep a crossbow from
22 injuring people unintentionally. However, conventional crossbows usually do
23 not have safety devices, so use of conventional crossbows is hazardous.

24 Some manufacturers have added a safety device to a conventional

1 crossbow to improve the safety of the crossbow, but the conventional safety
2 device in a crossbow is manual. A crossbow with a safety device is still
3 dangerous when the user forgets to engage the safety device.

4 To overcome the shortcomings, the present invention provides a trigger
5 assembly for a crossbow to mitigate or obviate the aforementioned problems.

6 SUMMARY OF THE INVENTION

7 The main objective of the invention is to provide a trigger assembly for a
8 crossbow, which has a safety device that automatically engages when the
9 bowstring is drawn and connected to the trigger assembly to improve the safety
10 of the crossbow.

11 The trigger assembly has a housing, a trigger, an actuating lever, a string
12 holder, a bowstring catch biasing member, a safety pin, a safety lock, a pushing
13 arm, a block, a block biasing member and a string stop. The housing has a top, a
14 bottom, a front end, a rear end, a side, a mouth transversely defined in the front
15 end and a slot transversely defined through the side and parallel to the mouth.
16 The trigger is pivotally mounted in the housing and has a top portion and a
17 bottom portion that protrudes from the bottom of the housing. The actuating
18 lever is pivotally mounted in the housing and abuts the top portion of the trigger.
19 The actuating lever has a front end with a hook and a rear end. The bowstring
20 catch is pivotally mounted in the housing and has a front end, a rear end, a string
21 hook and a leg. The string hook is formed on the front end of the bowstring catch
22 and corresponds to the mouth in the housing. The leg extends downward from
23 the rear end of the bowstring catch and selectively engages the hook on the
24 actuating lever. The bowstring catch biasing member is mounted in the housing

1 and has an end connected to the bowstring catch to make the string hook of the
2 bowstring catch retract from the mouth. The safety pin is moveably mounted in
3 the housing and has a top and a bottom that is supported on the rear end of the
4 actuating lever. The safety lock is moveably mounted in the housing and has a
5 front end, a rear end and a push rod. The rear end of the safety lock corresponds
6 to and selectively abuts the top of the safety pin. The push rod extends
7 transversely from the safety lock and into the slot in the housing. The pushing
8 arm is moveably mounted in the housing and has a bottom, a front end
9 corresponding to the mouth in the housing, a rear end and a protrusion abutting
10 the push rod on the safety lock. The block is pivotally mounted in the housing
11 and has a transverse rod laterally extending from the block and selectively
12 engaging the front end of the pushing arm. The block biasing member is
13 mounted in the housing and is connected to the block to push the block into the
14 mouth when the transverse rod on the block disengages from the front end of the
15 pushing arm. The string stop is pivotally mounted on the housing, extends into
16 the mouth and corresponds to the block.

17 Other objects, advantages and novel features of the invention will
18 become more apparent from the following detailed description when taken in
19 conjunction with the accompanying drawings.

20 BRIEF DESCRIPTION OF THE DRAWINGS

21 Fig. 1 is a perspective view of a crossbow with a trigger assembly in
22 accordance with the present invention;

23 Fig. 2 is an exploded perspective view of the trigger assembly in Fig. 1;

24 Fig. 3 is a side plan view of the trigger assembly in Fig. 2;

1 Fig. 4 is an operational side plan view of the trigger assembly in Fig. 3
2 with the bowstring hooked by the string hook;

3 Fig. 5 is an operational side plan view of the trigger assembly in Fig. 3
4 with an arrow on the stock of the crossbow having pushed the block and the
5 string stop away from the mouth in the housing; and

6 Fig. 6 is an operational front plan view of an adjusting device of the
7 trigger assembly in Fig. 2 with the angle of the sight mount adjusted by rotating
8 the adjustment knob.

9 DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

10 With reference to Figs. 1 to 3, a trigger assembly in accordance with the
11 present invention for a crossbow (40) having a stock (42) and a transverse bow
12 (not numbered) with a bowstring (46) is mounted on the stock (42) and
13 comprises a housing (10), a trigger (14), an actuating lever (13), a bowstring
14 catch (12), a bowstring catch biasing member (126), a safety pin (15), a safety
15 lock (16), a pushing arm (17), a block (18), a block biasing member (184), a
16 string stop (19), an optional sight mount (20), an optional adjusting device (not
17 numbered) and an optional resilient arrow retainer (11).

18 The housing (10) is mounted on the stock (42) and has a top (not
19 numbered), a bottom (not numbered), a front end (not numbered), a rear end (not
20 numbered), a side (not numbered), a mouth (102) and a slot (104). The mouth
21 (102) is defined transversely in the front end and has a top (not numbered) and a
22 bottom (not numbered). The slot (104) is defined transversely through the side
23 and is parallel to the mouth (102). In an optional embodiment, the housing (10) is
24 composed of two half shells (101) attached to each other.

1 The trigger (14) is mounted pivotally in the housing (10) and has a top
2 portion (not numbered) and a bottom portion (not numbered) that protrudes out
3 from the bottom of the housing (10).

4 The actuating lever (13) is mounted pivotally in the housing (10) and
5 abuts the top portion of the trigger (14). The actuating lever (13) has a front end
6 (not numbered) and a rear end (not numbered). The front end has a hook (132).

7 The bowstring catch (12) is mounted pivotally in the housing (10) and
8 has a front end (not numbered), a rear end (not numbered), a string hook (122)
9 and a leg (124). The string hook (122) is formed on the front end and
10 corresponds to the mouth (102) in the housing (10). The leg (124) extends
11 downward from the rear end and selectively engages the hook (132) on the
12 actuating lever (13).

13 The bowstring catch biasing member (126) is mounted in the housing
14 (10) between the top of the housing (10) and the bowstring catch (12). When the
15 leg (124) disengages from the hook (132) on the actuating lever (13), the
16 bowstring catch biasing member (126) pivots the string hook (122) of the
17 bowstring catch (12) out of the mouth (102).

18 The safety pin (15) is mounted moveably in the housing (10) and has a
19 top (not numbered) and a bottom (not numbered) that is supported on the rear
20 end of the actuating lever (13). When the safety pin (15) is held securely in place,
21 the trigger (14) cannot be pulled.

22 The safety lock (16) is mounted moveably in the housing (10) and has a
23 front end (not numbered), a rear end (not numbered) and a push rod (162). The
24 rear end of the safety lock (16) corresponds to and selectively abuts the top of the

1 safety pin (15). The push rod (162) extends transversely from the safety lock (16)
2 and out of the slot (104) in the housing (10), such that the safety lock (16) can be
3 moved relative to the housing (10) along the slot (104) by means of pulling the
4 push rod (162).

5 The pushing arm (17) is mounted moveably in the housing (10) and has a
6 bottom (not numbered), a front end (not numbered), a rear end (not numbered), a
7 protrusion (172) and an optional notch (174). The front end of the pushing arm
8 (17) corresponds to the mouth (102) in the housing (10), and the protrusion (172)
9 abuts the push rod (162) on the safety lock (16).

10 The block (18) is mounted pivotally in the housing (10) at the bottom of
11 the mouth (102) and has a top (not numbered), a bottom (not numbered) and a
12 transverse rod (182). The transverse rod (182) extends transversely from the
13 block (18) and is selectively engaged by the front end of the pushing arm (17). In
14 an optional embodiment, the optional notch (174) defined in the bottom at the
15 front end of the pushing arm (17) selectively engages the transverse rod (182) on
16 the block (18).

17 The block biasing member (184) is mounted in the housing (10) between
18 the block (18) and the bottom of the housing (10) to push the block (18) into the
19 mouth (102) when the transverse rod (182) on the block (18) disengages from the
20 front end of the pushing arm (17).

21 The string stop (19) is mounted pivotally in the housing (10) at the top of
22 the mouth (102), extends into the mouth (102) and corresponds to the block (18).
23 The string stop (19) will extend into the mouth due to the weight of the string
24 stop (19).

1 With reference to Fig. 2 to 4, when the bowstring (46) of the crossbow
2 (40) is drawn and enters the mouth (102) of the housing (10), the bowstring catch
3 (12) is pushed and pivots relative to the housing (10). The leg (124) on the
4 bowstring catch (12) engages the hook (132) on the actuating lever (13), and the
5 string hook (122) will hold the drawn bowstring (46) on the bowstring catch (12).
6 The pushing arm (17) is moved simultaneously by the bowstring (46), and the
7 protrusion (172) on the pushing arm (17) pushes the safety lock (16) along the
8 slot (104). Accordingly, the rear end of the safety lock (16) abuts and holds the
9 top of the safety pin (15) to keep the safety pin (15) from moving relative to the
10 housing (10). With the safety pin (15) held in place, the actuating lever (13) and
11 the trigger (13) are kept from rotating relative to the housing (10), and the drawn
12 bowstring (46) is securely held on the bowstring catch (12) and cannot be
13 released by pulling the trigger (14). Consequently, the trigger assembly is locked
14 automatically, and the user cannot fire the crossbow (40).

15 When the pushing arm (17) moves toward the rear end of the housing
16 (10), the transverse rod (182) on the block (18) will disengage from the notch
17 (174) in the front end of the pushing arm (17). The block biasing member (184)
18 will pivot the block (18) relative to the housing (10), and the top of the block (18)
19 extends into the mouth (102). At this time, the transverse rod (182) on the block
20 (18) abuts the front end of the pushing arm (17), such that the pushing arm (17)
21 will not move to the front end of the housing (10). Accordingly, the user cannot
22 push the safety lock (16) backward, such that the trigger assembly cannot be
23 unlocked.

24 If the user releases the bowstring (46) before the bowstring (46) is

1 engaged by the string hook (122) of the bowstring catch (12), the string stop (19)
2 will stop the released bowstring (46) and keep the bowstring (46) from moving
3 out of the mouth (102). This can keep the drawn bowstring (46) from be
4 unintentionally released before an arrow is inserted into the crossbow (40). The
5 limbs of the crossbow (40) can be kept from being damaged, and the useful life
6 of the crossbow (40) is prolonged.

7 With further reference to Fig. 5, inserting an arrow (50) into the
8 crossbow will simultaneously push the top of the block (18) and the string stop
9 (19) out of the mouth (10). The transverse rod (182) on the block (18) will leave
10 the position where the transverse rod (182) abuts the front end of the pushing
11 arm (17), such that the limitation to the movement of the pushing arm (17) is
12 released. The user can push the safety lock (16) backward to make the rear end of
13 the safety lock (16) disengage from the top of the safety pin (15). Consequently,
14 the user can pull the trigger (14), and the trigger (14) and the actuating lever (13)
15 pivots relative to the housing (10). The hook (132) on the actuating lever (13)
16 unhooks the leg (124) on the bowstring catch (12), and the bowstring catch (12)
17 pivots up relative to the housing (10) to release the bowstring (46) from the
18 string hook (122). Accordingly, the drawn bowstring (46) is released, and the
19 arrow (50) is fired from the crossbow (40).

20 The trigger assembly automatically locks when the bowstring (46) is
21 drawn into the mouth (102) in the housing (10). This can keep a person from
22 being injured unintentionally if the user forgets to lock the trigger assembly.
23 Furthermore, the trigger assembly cannot be unlocked before an arrow (50) is
24 inserted into the crossbow so the tightly drawn bowstring (46) cannot be released

1 if no arrow is on the stock (42). This can keep the limbs of the crossbow (40)
2 from being damaged, such that a second safety effect is provided and the useful
3 life of the crossbow (40) is prolonged.

4 With reference to Figs. 1, 2 and 6, the optional sight mount (20) is
5 attached to the top of the housing (10) to hold an aiming device (not shown) such
6 as a scope to assist in aiming the crossbow (40) arrow at a target. The sight
7 mount (20) is attached pivotally to the top of the housing (10) and has a bottom
8 (not numbered), a pivot point (not numbered), a front segment (not numbered)
9 and a rear segment (not numbered). The front segment is forward of the pivot
10 point, and the rear segment is aft of the pivot point.

11 The adjusting device is mounted in the housing (10) to adjust the sight
12 mount (20) vertically relative to the housing (10). The adjusting device
13 comprises an adjustment knob (30), a pushing block (36) and a sight mount
14 biasing member (22). The adjustment knob (30) is rotatably mounted in the rear
15 end of the housing (10) and has a stub (32) and a cam (34). The stub (32) has an
16 outer periphery (not numbered) and rotatably extends into the housing (10). The
17 cam (34) is formed on the outer periphery of the stub (32).

18 The pushing block (36) is mounted moveably in the housing (10) and
19 has a top (not numbered) and a bottom (not numbered). The top of the pushing
20 block (36) extends out from the top of the housing (10) and abuts the bottom of
21 the sight mount (20) in the rear segment. The bottom of the pushing block (36) is
22 concave and abuts the cam (34) on the adjustment knob (30). The sight mount
23 biasing member (22) is mounted between the top of the housing (10) and the
24 bottom of the sight mount (20) at the front segment.

1 Rotating the adjustment knob (30) causes the cam (34) to move the
2 pushing block (36) up or down. Consequently, the rear segment of the sight
3 mount (20) can be pushed up by the pushing block (36) or down by the sight
4 mount biasing member (22), and the vertical alignment of the sight mount
5 relative to the housing (10) is changed. Accordingly, the vertical alignment of an
6 aiming device attached to the sight mount (20) can be adjusted conveniently and
7 easily.

8 With reference to Fig. 1, 2 and 5, the optional resilient arrow retainer (11)
9 is mounted on the top of the housing (10) and extends downward to correspond
10 to the mouth (102) in the housing (10). When an arrow (50) is put on the stock
11 (42) of the crossbow (40), the resilient arrow retainer (11) will press against the
12 arrow (50) to make the travel of the arrow (50) on the stock (42) smooth.

13 Even though numerous characteristics and advantages of the present
14 invention have been set forth in the foregoing description, together with details
15 of the structure and function of the invention, the disclosure is illustrative only,
16 and changes may be made in detail, especially in matters of shape, size, and
17 arrangement of parts within the principles of the invention to the full extent
18 indicated by the broad general meaning of the terms in which the appended
19 claims are expressed.